

Introduction

Welcome to the 7th National Spinal Cord Injury Conference!

Celebrating our history

Cesar Marquez-Chin, Jennifer Mokry

In a year when we are celebrating 150 years since Canadian Confederation, it is vitally important that we reflect on our history, recognize the vision of our leaders, and acknowledge the proud legacy of our Canadian Veterans. Lyndhurst Lodge opened its doors in January 1945 as Canada's first rehabilitation centre for people with spinal cord injury (SCI). The facility was a mansion located in a residential area, west of mid-town Toronto, and was the result of the dedicated efforts of a few idealists who believed that a fulfilling life after SCI was possible. These individuals included Dr. Harry Botterell, who served as the chief medical officer in the No 1. Canadian Neurosurgical Hospital at Basingstoke, England until 1945, and Captain John Counsell, a Canadian platoon commander, who was injured during the Battle of Dieppe (France, 1942).

Dr. Botterell and John Counsell undertook the daunting task of convincing medical doctors, military authorities, and policy makers in all levels of government that individuals with SCI should not spend their remaining days in bed and instead return to living and working independently in the community. Together with Dr. Albin T. Jousse, the first medical director at Lyndhurst Lodge, they introduced several innovations that would shape care after SCI. These included a strong emphasis on physical retraining and education. The physical component was designed to maximize strength for performing activities of daily living, while the goal of the education was to equip patients with the skills to manage their care once in the community. Topics included prevention of bladder infections and pressure sores. Patients were also encouraged to go out into the community in the evenings and home during the weekends, and then share their experiences with their peers upon returning.

During the first year of operations, patients at Lyndhurst Lodge were World War II Veterans with

SCI. In August of 1946, the first members of the civilian community were admitted for rehabilitation, thanks in great part to the efforts of John Counsell and the newly created Canadian Paraplegic Association—the first organization in the world founded and administered by individuals with SCI—and over which Mr. Counsell presided until 1961. In November 1974 operations moved to what was called Lyndhurst Hospital. In addition to better facilities and larger capacity, the new hospital included a laboratory for spinal cord research. The next two decades saw the gradual inclusion of other services including a clinic to provide assistance with urology, sexuality, reproduction, an acupuncture clinic, and an electronic music program, among other innovations.

In 1998 Lyndhurst Hospital amalgamated with two other rehabilitation centres in the city to become part of the Toronto Rehabilitation Institute. It has been known as the Lyndhurst Centre since. In 2011, the Toronto Rehabilitation Institute merged with the University Health Network, an entity that now includes The Toronto General Hospital, Princess Margaret Hospital, Toronto Western Hospital, and all of the original founding rehabilitation institutions, including the Lyndhurst Centre, which continues to provide rehabilitation care and services for individuals with SCI.

As the largest spinal cord rehabilitation center in Canada, the Lyndhurst Centre admits over 300 patients each year to its 60 inpatient beds. The 17 outpatient clinics support more than 20,000 visits a year and provide patients with unique services to meet their needs over their lifetime, including bone density, urology, physiatry, nursing, seating, skin and wound, assistive technology, and many others. The Lyndhurst Centre provides a unique and encouraging environment that inspires new possibilities through the patients' rehab journey. Through the Self-Management Support for

Spinal Cord Injury initiative, the interdisciplinary team integrated goal setting, patient education, and transition planning across the continuum of SCI rehabilitation from acute care to community for 26 domains of SCI rehabilitation. The team piloted and implemented in 2016 the Patient Oriented Discharge Summary (PODS), which is the first self-management tool in Canada for SCI patients using a teach-back style meeting oriented to the patient to consolidate their learnings and focusing on self-efficacy. The Lyndhurst Centre's PODS initiative

received the University Health Network's Local Impact Award in 2016 and Honourable Mention for the 2016 Team/Organizational Champion Award from the Canadian Patient Safety Institute.

Lyndhurst has also become the hub of an active team of researchers dedicated to improving rehabilitation processes and the lives of people living with SCI. Continuing a 70 year collaboration, it shares physical space and resources with Spinal Cord Injury Ontario (formerly the Canadian Paraplegic Association).

A Research Update from the Toronto Rehabilitation Institute

In 2014's update, the Toronto Rehabilitation Institute (TRI) – University Health Network explained its vision and strategies for accelerating research into practical use. Years of dedication to that vision are now paying dividends in three key areas of focus:

- (1) Prevention of Illness and Injury
- (2) Restoration of Function following Injury
- (3) Enabling Independence and Aging-in-place

The state-of-the-art Challenging Environment Assessment Labs (CEAL) have been leveraged to produce important discoveries and evidence for structural and behavioural change. StairLab researchers showed that a 2" increase in stair run could increase stair safety by a factor of 3. The resulting change to the National Building Code of Canada will save an estimated 39 lives and prevent 13,000 serious injuries in the first five years alone. Using WinterLab, researchers developed a new – yet strikingly practical – method to test the slip resistance of footwear on ice. Footwear testers walk up and down wet or dry icy slopes until they start to experience slips – the point called the Maximum Achievable Angle. Footwear passing the minimum 7° slope in all conditions is awarded at least one snowflake and listed on the website ratemytreads.com. The public rewarded our faith in their personal self-interest by visiting the website millions of times, and purchasing slip-resistant footwear when given the choice. Moving back indoors, research in CareLab – a simulated private hospital room – has led to the invention of three device systems that show promise in solving practical problems related to: lifting and transferring; bedsores; and hand hygiene.

In 2017, TRI celebrated the grand opening of DriverLab as the 8th CEAL simulator. DriverLab is one of the most advanced driving simulators in the world—certainly, the most advanced that will be used for planned driver-ability studies. DriverLab is a dome

with a 360° floor-to-ceiling screen illuminated by 12 high-definition 3D projectors. At the centre of the dome is a real Audi A3 car, stripped of wheels and motor, mounted on a 360° turntable that rotates within the dome. The entire dome sits upon a 6 degree-of-freedom motion base. Coordinated screens, motions, and haptic feedback provide a startlingly real driving experience. The rain simulator sprays real water on the windshield. The headlight glare simulator uses active LEDs to shine headlights at the driver that are coordinated with on-screen movements. TRI researchers will use this challenging environment to assess: older drivers; drivers under the influence of opioids and other prescription painkillers; people with dementia experiencing a self-driving car; people who get motion sick; and more.

Since the last update, two TRI-based start-up companies have made much headway in the medical device industry. BresDx® by Bresotec Inc. is a small, portable, accurate, and easy-to-use home sleep test that health professionals can use as an aid in the diagnosis of sleep apnea. BresDx® received Health Canada approval in 2014 and was created by Dr. Doug Bradley, Dr. Hisham Alshaer, and Dr. Geoff Fernie. MyndMove™ is a non-invasive functional electrical stimulation (FES) therapy for individuals with arm and hand paralysis due to a stroke, spinal cord injury, or other neurological injury. Produced by MyndTec™ Inc., MyndMove™ is the result of years of hard work by Dr. Milos Popovic and his team. They have succeeded in making amazing FES therapy available to the public. BresDx® and MyndMove™ were the basis for TRI investigators winning both University Health Network (UHN) Inventor of the Year awards in 2014 and 2015— an outstanding achievement given the depth and breadth of research at Canada's largest research hospital.

About the Neural Engineering and Therapeutics (NET) Team



Toronto Rehab's research impact has grown substantially over the last ten years as the institute has made its mark as the top rehabilitation research centre in the world. Among these efforts, the Neural Engineering & Therapeutics (NET) Team is arguably, "the crown jewel" driving significant advances in spinal cord injury rehabilitation research. The NET Team is comprised of 10 scientists, 19 research staff, 5 postdoctoral fellows and 26 graduate students.

Toronto Rehab is very proud of the breadth and depth of the research activities undertaken by this research group. There is exceptional balance across multiple axes: from basic science to clinical intervention; from acute rehab to community independence; from public health care recommendations to commercial products; from science fiction to reality. The next decade will be exciting as we work toward bringing new therapies and technologies to fruition and raising the standards for rehabilitation service delivery in our communities.

Meet the Scientists

Cathy Craven, MD, FRCPC, MSc

Redefining Cure. Reshaping Rehabilitation Care.



Dr. Craven is the Medical Lead of the Spinal Cord Rehab Program at TRI-UHN, a senior scientist, and leader of the Neural Engineering and Therapeutics Team. She is an Associate Professor in the Department of Medicine at the University of Toronto. Her research redefines patients' experiences with health conditions following spinal cord injury, helping them to prevent, treat, or better manage heart disease, diabetes and fracture. She leads the SCI-HIGH project, reshaping SCI rehabilitation by 2020 through developing and implementing indicators of quality care linked with accreditation standards. She is Chair of the RHI Care Committee. She leads TRI's Central Recruitment program with vision and tenacity.

Mark Bayley, MD, FRCPC

Bridging the Knowledge-Practice gap to optimize recovery



Dr. Bayley leads large-scale national and international research and health systems change projects. He is currently Medical Director and Senior Scientist at the Brain and Spinal Cord Rehabilitation Program at TRI-UHN. He is Associate Professor and Saunderson Family Chair in Brain injury Research at University of Toronto in the Division of Physiatry, Faculty of Medicine. His research focuses on understanding how to speed brain recovery using a variety of modalities like exercise, virtual reality, tele-rehabilitation and functional electrical stimulation. Importantly, he has bridged the know-do gap by making best evidence available to clinicians through smartphone apps and Best Practices guidelines in stroke, concussion and brain injury. His work has provided the foundation for the redesign of stroke and brain injury rehabilitation systems across Canada.

Julio Furlan, MD, LLB, MBA, PhD, MSc, FRCPC

Predicting recovery and resource requirements through outcome science



Dr. Furlan is an Affiliate Clinician Scientist and staff neurologist at Lyndhurst Centre, TRI-UHN. He is an Assistant Professor in the Department of Medicine, Division of Physical Medicine and Rehabilitation at University of Toronto. His research focus is outcome measures, predictors of outcomes, and secondary complications of spinal cord injury or disease. He uses clinical instruments, neurophysiology and neuroimaging outcomes to evaluate impairment, describe disability and predict recovery. He has ongoing research related to autonomic function, pain modulation, and muscle control.

Susan Jaglal, PhD, FCAH

Paying attention to early warning signs



Dr. Jaglal is Vice-Chair Research and Professor, Department of Physical Therapy at the University of Toronto. She holds the Toronto Rehabilitation Institute Chair at the University of Toronto where she is Associate Academic Director of Research responsible for mentorship. She is also a Senior Scientist at the Institute for Clinical Evaluative Sciences and the Osteoporosis Program at Women's College Hospital. In 2015 she was inducted as a Fellow of the Canadian Academy of Health Sciences which recognizes outstanding researchers. She has published and lectured widely in her areas of research which include: osteoporosis and hip fracture, spinal cord injury and rehabilitation health services with emphasis on utilization, appropriateness, self-management and knowledge transfer. She holds a PhD in Epidemiology from the University of Toronto.

Sukhvinder Kalsi-Ryan, PhD
Grasping for Neurorestoration



Dr. Kalsi-Ryan, is a Clinician Scientist in the field of upper limb assessment and recovery and spine pathology at TRI-UHN and is also Assistant Professor at the University of Toronto, Department of Physical Therapy. Her research is oriented to establishing methods to quantify neurological change after injury and studying neuro-restorative methods to enhance and optimize function for those with neurological impairment. She is the Founder of her own company that manufactures the GRASSP; she acts as a consultant for neurological trials worldwide and has recently co-founded the Spine Therapy Network. Her additional interests include: outcome measurement, upper limb recovery, traumatic and non traumatic SCI, quantification of neurological disorders.

Cesar Marquez-Chin, PhD
Creating the future of rehabilitation today



Dr. Marquez-Chin is a Scientist in the Neural Engineering and Therapeutics Team at TRI-UHN. His research focuses on creating new technologies to restore the ability to move voluntarily after stroke and spinal cord injury. Central to his work is the development of systems that connect brains and machines directly. When used as a therapeutic intervention, these brain-machine interfaces can help patients with the most severe forms of paralysis move again. He also creates low-cost robotic technologies and advanced alternate user interfaces that support patients and their service providers during physical and occupational rehabilitation.

Kei Masani, PhD
Listen to your body to remain in balance



Dr. Masani is a Scientist at TRI-UHN. He is an Assistant Professor in the Institute of Biomaterials and Biomedical Engineering at the University of Toronto. Broadly speaking, his research aims to improve the mobility of people who experience neurological impairment. His approach to investigating human movement is neuromechanical - looking at the union of neurophysiology and physics. With this perspective, he focuses specifically on developing accurate assessments and therapeutic tools using functional electrical stimulation for standing, walking and adapted exercise.

Kristin Musselman, PT, PhD
Optimizing movement after nervous system damage



Dr. Musselman is a Scientist at TRI-UHN. She is an Assistant Professor in the Department of Physical Therapy. Her research focus is on optimizing everyday functional movements, such as walking and reaching. This includes training effective balance reactions in adults with spinal cord injury, and studying whether wearable sensors can detect those at risk of falls. She also studies the effectiveness of functional electrical stimulation to improve arm function in young children with cerebral palsy.

José Zariffa, PhD, PEng
Reaching for better hand function



Dr. Zariffa is a Scientist in the Neural Engineering and Therapeutics team at TRI-UHN and an Assistant Professor at the Institute of Biomaterials & Biomedical Engineering, University of Toronto. His research focuses on developing technology for upper limb neurorehabilitation. For example, to evaluate the true impact of rehabilitation strategies on daily life, his team is developing a system to measure hand function at home using wearable cameras. Looking to the next generation of assistive technologies, he is learning how to intercept and interpret neural signals to create direct interfaces with the nervous system.

Milos Popovic, PhD, PEng
Improving independence through discovery, innovation and commercialization



Dr. Popovic is Associate Scientific Director, Research, at TRI-UHN and the Toronto Rehab Chair in Spinal Cord Injury Research. He is also a Professor in the Institute of Biomaterials and Biomedical Engineering at the University of Toronto, as well as Senior Scientist in the Neural Engineering and Therapeutics Team. His fields of expertise are functional electrical stimulation, neuroprostheses, neurorehabilitation, brain-machine interfaces, modeling and control of linear and non-linear dynamic systems, robotics, and signal processing. His interests are in the areas of neurorehabilitation, physiological control systems, assistive technology, and brain-machine interfaces.

Recent Accomplishments of the Neural Engineering and Therapeutics Team

The research activities of the Neural Engineering and Therapeutics Team have the ultimate goal of having a positive impact on the health and quality of life of individuals with spinal cord injury. These are examples of relevant contributions that the team has achieved during the last five years.

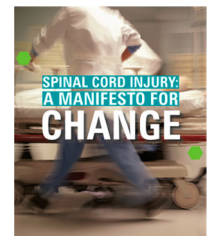
The NET team developed the standard protocols for testing bone density in the knee region. These protocols are used in several sites in Hamilton, Quebec City, Calgary and Toronto during routine bone density assessments for individuals with sub-acute and chronic SCI.



The GRASSP is a clinical impairment measure for the upper limb for use after tetraplegia. The measure includes three domains which are important in describing hand function. The three domains are: strength, sensibility, and prehension.



Spinal Cord Injury: A Manifesto for Change is an unprecedented call to action and a plea for Canadian health-care providers and stakeholders to work in coordination to improve care and the health of people living with SCI in Canada.



MyndMove is a non-invasive therapy that combines patient participation, therapist expertise and the MyndMove functional electrical stimulation (FES) device to restore voluntary hand and arm function in patients suffering from upper-limb paralysis.



Dr. Nimmi Bharatwal Lectureship

In recognition of Dr. Nirmala Dilip Bharatwal's 40 years' of service to the improvement of human health at the Lyndhurst Centre, Toronto Rehab Foundation established the Dr. Nirmala Dilip Bharatwal Lecture Series in Spinal Cord Injury Research. The Lectureship offers the opportunity to become informed about the latest medical research, diagnosis and treatments for both brain and spinal cord related issues, and allows us to honor the outstanding legacy of Dr. Nimmi Bharatwal - who has selflessly dedicated her life and work to advancing spinal cord injury care.

We are delighted to welcome Dr. John F. Ditunno Jr. as this year's speaker. Dr. Ditunno is a Professor of Rehabilitation Medicine at the Jefferson Medical College, Thomas Jefferson University and Investigator for the Regional Spinal Cord Injury Center of the Delaware Valley (RSCICDV) which he directed for almost three decades. In his lecture, entitled 'Linking Spinal Cord Rehabilitation Between Wars: The Deaver-McKenzie Legacy,' Dr. Ditunno will explore the lessons and failures to organize care for individuals with spinal cord injuries between World War I and World War II.

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2017 Champion of Change Award

Professor Molly Verrier, MHSc, Dip (P&OT)



With a career spanning 30 years in the field of neuroscience, including spinal cord injury, Professor Verrier is this year's winner of the Champion of Change award. Her contributions to the field have been far-reaching. She has lead and conducted research at the basic science, clinical trial and health system/policy levels. She has collaborated extensively with many scientists in a variety of research fields including pharmaceutical interventions, basic neurophysiology, spasticity, cortical reorganization, sensorimotor recovery, clinical assessments for sensorimotor control, rehabilitation interventions and service delivery. Professor Verrier has published and presented on a wide range of topics in SCI.

Professor Verrier has mentored and supervised numerous graduate students, many of whom have gone on to establish their own careers as scientists and leaders in the field of SCI and beyond. In addition to her numerous academic and leadership contributions, she is most well-known as a visionary with a tireless drive to advance the field of SCI rehabilitation through critical analysis, challenging the status quo and advocacy. Underpinning these efforts has always been a fundamental desire to improve the lives of individuals living with spinal cord injury while simultaneously training and mentoring academic clinicians and researchers to continue advancing this work.

Professor Verrier completed her training in physical and occupational therapy at the University of Toronto (U of T). Following graduation, she practiced neurological physical therapy at the Toronto Western Hospital (TWH), providing her with an introduction to the field of spinal cord injury and inspiring many to follow in her footsteps. Professor Verrier completed her graduate studies in clinical neurophysiology and health science at McMaster University, diversifying her background in health care delivery and neurological care. Upon graduation, she joined the Division of Physical Therapy faculty at the University of Toronto as an Assistant Professor and became the lead of the Human Neuromotor Control Laboratory at the Playfair Neuroscience Unit situated at the TWH. Between 1988 and 1994 Professor Verrier was the Director of the then Division of Physical Therapy in the

Department of Rehabilitation Medicine, which under her leadership, became the Department of Physical Therapy. Professor Verrier was instrumental in establishing the Graduate Department of Rehabilitation Science in 1994 at the University of Toronto, which she chaired. Over the subsequent decade, she led the implementation of a BScPT Evidence-Based Curriculum, a Professional Master's Program in Physical Therapy, and MSc and PhD Programs in Rehabilitation Science, raising the profile of these departments within the Faculty of Medicine.

Through collaboration, tenacity, and advocacy, Professor Verrier spearheaded the relocation of the Departments of Physical Therapy, Occupational Science and Occupational Therapy, Speech Language Pathology and the Graduate Department of Rehabilitation Science from a small outdated facility at 256 McCaul Street to a large, modern facility at 500 University Avenue equipped with research laboratories and teaching space, situated in close vicinity to several major Toronto teaching hospitals and other academic departments.

Professor Verrier is currently Associate Professor Emeritus in the Department of Physical Therapy at the University of Toronto and is a member of the Board of Directors at West Park Healthcare Centre.

Professor Verrier has previously been co-lead of the ONF/REPAR SCI Mobility research team, the Ontario SCI Informatics Strategy, the RHSCIR 2.0 Walking Measures group and was a member of the Ontario Neurotrauma Foundation's SCI Quality of Life Committee. She has also been a reviewer of major research grants. Throughout her career, Professor Verrier has received several awards including the Enid Graham Memorial Award, the most prestigious award bestowed by the Canadian Physiotherapy Association.

Beyond her leadership contributions and academic achievements she is best known for her quick wit, keen sense of humour, and her thoughtful and challenging questions. Her ability to see things from a unique perspective is her brand. She has been a generous mentor and strong advocate for the field of spinal cord injury, rehabilitation and the profession of physical therapy.

Contributors to nomination letter:

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